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ABSTRACT

The paper suggests various ways that energy education can be integrated into the curriculum and advocates an interdisciplinary approach to energy studies. Five approaches to energy education are discussed. One, the separate course approach, seems unlikely to come about given the static nature of the curriculum. Two, ignoring the topic, may occur in some systems, but energy education will eventually find its way into the curriculum. Three, the use of energy education units developed for social studies or science courses is already occuring and an abundance of materials exists. The major shortcoming is that this approach fails to capitalize on the academic strengths of teachers in other departments. The fourth approach is most likely to occur: assimilation of energy education into social studies textbooks and thus into the curriculum. Major drawbacks are the treatment of the topic in a mass-market basal textbook and the biased nature of free educational materials. The fifth approach, interdisciplinary studies, has the potential for increasing the effectiveness of teaching. Social studies teachers can provide effective instruction on the examination of the social dimensions of energy issues; science teachers can provide students with opportunities to develop understanding of scientific and technical phenomena of energy. (Author/KC)

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ENERGY IN THE SOCIAL STUDIES CURRICULUM:

ACCOMMODATION OR ASSIMILATION?

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ENERGY IN THE SOCIAL STUDIES CURRICULUM:

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The social studies curriculum is constantly barraged by "hot topics"; the latest, most innovative, superlative-this and superlative-that hit the advertising pages of Social Education in predictable marketing cycles.* For the most part the curriculum is able to withstand the onslaught; that is, what happens to kids in classrooms really doesn't change much over the years. What does happen to the hot topics? Ask yourself. What has resulted from the onslaught of advocates for consumer, environmental, multiethnic, multicultural, law-related, population, values, peace, global, moral (and so forth) education? Now it's energy education. What will happen to energy studies in the social studies curriculum?

I have been interested for some time in the problems of introducing science-related social issues into the precollege curriculum (Eckenrod and Holmes, 1973). My interest in the moral, political, and social issues raised by the application of scientific knowledge to the technology of society has ranged broadly over a wide spectrum of topics, not many of which, however, have become hot topics. My work with the NCSS Advisory Committee on Science and Society has led to an interest in energy problems.

In this paper I express my views on some of the social and institutional forces that act on curriculum decisions, review some possible "futures" for the entry of energy into the curriculum, provide a few suggestions on teaching methods, and offer a few ideas about resources for making the integration of energy studies a more effective endeavor.

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* But there are also occasional offerings of substantive articles; see Gillespie (1980) and Wood (1979).

Another Regressive Social Era

I believe that education in the United States is as much or more a moral enterprise for transmitting the culture than it is an institution for equipping people with skills of ethical reflection or scientific inquiry. From this perspective, the introduction of any topic into the curriculum involves a struggle with the guardians of the established set of "truths" that has been admitted into the body of "appropriate" knowledge. Decisions about what to include or exclude come down to value preferences.

Events in recent months indicate to me that good old fashioned American anti-intellectualism is on the rise again. The public has expressed a preference for leaders who promise simplistic solutions to incredibly complex problems. Unlike the British, who have managed to go through their decline from world prominence with style, we seem to be lashing out at the effects on our economic well-being of shifts in the global balance of power. It appears that we're not yet ready to pursue cooperative international changes. It seems as though people in the United States are insisting that we maintain our world dominance in wealth and resource consumption at any cost; it looks as though we will initiate an arms race with the Soviet Union and cut taxes to stimulate the domestic economy. It will be interesting to watch the new administration face up to the realities of the 1980s as we enter that decade in January.

The consumption of petroleum in the United States is, of course, at the heart of the international economic crunch in which we find ourselves. For the first time we are faced with the prospect of paying the international going rate for oil and we are finding it quite painful. The oil problem stimulates a whole set of other issues relating to energy and, as we would expect, some considerable demand for "educating" the public about the realities

of the situation. One of the things I've learned in nearly fifteen years of effort to "upgrade" the scientific content of the curriculum is that people in the United States are not predisposed to tackling complex problems using scientific processes. In fact, there is a strong streak of antiscientism that has been nurtured by unreasonable expectations that, somehow, science could solve all of our problems--social and technological--when in fact it cannot. One very experienced curriculum developer recently commented on the scene (Mayer, 1980):

> We live in a controversial and litigious age, and our students constitute the citizenry who will decide the fate of many issues based on [scientific] data. If we treat the classroom as an isolate from societal problems we fail to prepare students to clarify their values and make judgments on the basis of the best information available.
>
> Further compounding the issue is the rise of conservatism and a nostalgic longing to turn back the clock. Because the popular conception of science is not congruent with the nature of the discipline itself, science is frequently looked upon as the cause of our problems rather than as a potential solution for them.*

By and large the science and social studies curriculum programs that dominate what happens to young people in schools consist of encyclopaedic "coverage" of scientists' answers to scientists' questions and, for the most part, these materials carefully avoid any controversial issues. The study of energy, one would assume, ought not to involve a lot of controversy and should be easy to integrate into the existing curriculum. But, like any newcomer to the curriculum, energy faces resistance. I expect that, eventually, there will be a synthesis of what is presently proposed and energy <u>will be</u> incorporated in the social studies curriculum. There are, however, alternative paths for energy studies to take in becoming part of the curriculum; it's a

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* See also James Michener (1980).

process that will involve both accommodation and assimilation. But, a paper intended to stimulate the thinking of critical scholars can't begin with such a simple conclusion; one is expected to explore all of the possibilities, combinations, and permutations.

The Curriculum Alternatives

What are the possible futures for energy education in the social studies curriculum in the United States? (I'd include the other countries of North America in the discussion except that they are in somewhat different situations with regard to the politics of oil nowadays.) From the viewpoint of conventional language usage the paper title suggests only two futures: accommodation (to fit into the existing curriculum without disturbing the separate character of the topics), or assimilation (the gradual blending together of the subject matter). With a bit of metaphoric license, though, we can expand our conception of the two terms into four possibilities. Social science usage gives us four ideal forms of conflict resolution among competing groups:

- Accommodation, the way in which people settle differences while maintaining their separate cultural identities;
- Assimilation, the process by which cultural differences between people are reduced through social blending;
- Amalgamation, the physical or biological blending of cultures in which the separate identities of each are changed; and,
- Annihilation, the way that one culture can terminate (with "extreme prejudice") all conflict with another.

Perhaps the parallels among these processes of social conflict resolution and the kinds of curriculum decision making we face are too vague to pursue further (though they fit my sense of metaphoric thinking), so I'll continue the discussion along more familiar lines of "curriculum-speak" and insinuate the social science perspective at appropriate points.

This symposium was organized around a mutual concern with alternatives open to social studies educators on treating energy education. I have conceived of five possible courses of action:

- Establish a separate course on energy, that is, a new subject added on to the general curriculum;
- Ignore energy education completely; pass the buck to other subject matter departments such as science or engineering;
- Infuse separate units of study into the social studies and science departments; accommodation into the existing departmental curriculum programs;
- Develop interdisciplinary energy studies for use in social studies-science team teaching situations; and
- Integrate energy studies into the conventional social studies and science curriculum programs, that is, assimilate the "appropriate" concepts and principles of energy studies into the textbooks for each field.

Let me examine each of these possible curriculum futures and express judgment about the pedagogic worth and likely "look" of each alternative when, or if, it comes about.

The Separate Course Approach. Except for Houston, the first possible future (adding energy studies to the general curriculum) seems most unlikely to come about. The curriculum is generally very static and the status quo is defended vigorously by all of the present stakeholders. There are advocates of introducing courses on energy into the curriculum; not surprisingly most of them just happen to have prepared series of textbooks ready to go.

Ignoring the Topic. The second possible future, simply ignoring energy studies in social education (rather than annihilating the topics), will probably happen in some places where the "basics" are cherished to the point that even current events gets short shrift in allocating time for classroom treatment. Energy problems are going to be with us for a long time though, and energy education will find its way into the social studies curriculum.

The next three options describe alternative levels of jurisdiction for energy subject matter in conventional social studies courses and in nonconventional interdisciplinary efforts.

Separate Departmental Units. One infusion strategy, already happening, involves the use of energy education units developed for use in social studies or in science courses. There are many producers of energy education materials now competing for the precollege curriculum market; their products range from the practitioner-developed (technically accurate and objective but lacking the polished commercial look) materials produced by projects funded through the National Science Teachers Association* to the slick but politically and economically biased materials of the investor-owned energy companies pouring into classrooms all over the country. One ERIC publication (Coon and Bowman, 1978) classifies about 78 "action-oriented" activities ("appropriate" for the grade level, subject matter, and energy concept involved) into five broad subject areas and specific course offerings as follows:

Science	including health, nature studies, home economics, drivers education, etc.
Mathematics	including arithmetic, geometry, industrial arts, etc.
Social Studies	including geography, population, history, etc.
Language Arts	including reading, creative writing, etc.
Fine Arts	including music, art, theater, etc.

The Enterprise for Education's (1979) Energy 80, a "soft-cover student text [that] treats major concepts of energy production, use and conservation through extensive full color illustration and concise text," promises to provide "a full-year course at the junior high school level" with "help...

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* Project for an Energy-Enriched Curriculum (NSTA, 1980) directed by John Fowler.

provided in making one semester or shorter adaptations, and in selecting individual lessons for use in other grade levels and subjects." There is presently an abundance of materials available for infusion into existing science and social studies curriculum programs at every level.*

I think that the biggest shortcoming of the separate units approach lies in the failure to capitalize on the academic strengths of teachers in other departments; science teachers don't draw upon the capabilities of social studies teachers to facilitate the objective analysis of the social implications of complex technical problemss, and social studies teachers aren't able to capitalize on the knowledge of their science department colleagues about the scientific and technological dimensions of energy topics. I would guess that most social studies teachers are in the same situation as the young people surveyed a couple of years ago by the National Assessment of Educational Progress (1978) group. The NAEP study reported that while young adults demonstrated quite a lot of concern and awareness about energy problems and issues they did not indicate any real understanding of energy technology--economic trade-offs, time lags in energy production, energy conversion processes, and so forth. The separate departmental treatment leaves it up to students (by default if not design) to synthesize these discrete curriculum experiences and develop, on their own, the complex understandings that it takes to make the kind of informed social-technical energy policy decisions that we face today. I see very little prospect for this happening; it's just not very likely that high school students will behave more rationally than their teachers. One way to increase the pedagogic "power" of energy curriculum units is to involve teachers from both social studies and science in interdisciplinary programs.

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* See also Kathleen Lane (1980) and other resources in the April 1980 issue of Social Education.

Interdisciplinary Units. The frequency of use of team-taught interdisciplinary energy study units is probably quite low; not much of anything is taught in interdepartmental course modes--everyone has to get in a full teaching load and "sharing" bodies with someone else cuts into that. Besides that, it takes a rather innovative group of teachers to implement, adapt, and stick to a curriculum that takes them out of the safety of their closed-door, single-subject routines. Most of us are not really very innovative (let alone bright enough to really understand all of the social and technological factors that affect energy dilemmas) and schools don't provide much in the way of reward for risk-takers who might want to move students around or combine classes (in a sense amalgamating departmental offerings).

On the other hand, though, interdisciplinary studies do have potential for increasing the effectiveness of teaching as assessed by improvements in student understanding of energy-related problems. It seems clear to me that science teachers have the best potential for helping students make sense of the complex technical dimensions of energy conversion, conservation, and so forth. Similarly, social studies teachers are more likely to have better capabilities for helping students clarify the political, social and ethical elements of making practical judgments that involve value decisions--the kind of "choices between competing and conflicting interests and value orientations" that Benne and Birnbaum (1978) identified as part of the challenge of dealing with science-related social issues. I would predict, however, only a limited influence on the general curriculum from the introduction of interdisciplinary curriculum materials, such as the Human Sciences Program (at least the first two of the three years of it), the science and social science program for early adolescents developed at the Biological Sciences Curriculum Study (BSCS).

It should be clear that my professional judgment gives preference to the possibilities for collaborative, interdisciplinary approaches to teaching such complex topics as energy studies. I have come to believe that the best we can do for students is to draw upon all the human and curriculum resources available to provide young people with the richest possible learning experiences. If we do this I think it's more likely--given honesty on the part of teachers about the tentative, cumulative, evolving nature of scientific knowledge (including social science) and the pedagogic courage to engage in open inquiry with students--that our young people will make better sense out of complex social-technological issues than we give them the chance to do now.

Integration in the Curriculum. A more likely curriculum future for energy studies lies in the assimilation of energy topics into the conventional curriculum programs of social studies and science. In reality, the process I have described, of assimilating energy into the contemporary curriculum, is generally moot with regard to the science curriculum. We all know that energy is a fundamental concept among the modern natural sciences. Our colleagues in science education have, moreover, to my mind, taken a clear edge in efforts to balance the study of modern energy problems between strictly scientific technical inquiry and consideration of the personal and social dimensions of energy studies. The practitioner-oriented journals of science education provide much more in the way of interdisciplinary inquiry; the science textbooks are following suit. Because, just as in science education, the authors of opinion-setting journal articles in social studies tend also to be the writers of textbooks, we can expect energy to become a part of the prevalent curriculum form in the United States--the organization of instruction around a textbook. The fifth of the futures that I see for energy education is assimilation into the social studies textbooks.

As an industry serving the moral enterprise of education, however, textbook publishers are subject to enormous pressures from all of the guardians of the curriculum and those who would reshape it in one form or another. Textbooks prepared for elementary and secondary schools have to pass the scrutiny of a public that does not generally understand the difference between philosophic doctrine and the principles of scientific inquiry. There are many dimensions of difference between these products of human thought but two that lead to textbook controversies frequently stem from religious principles and economic values. Energy education will have to pass through the "filtering process" that the textbook industry employs to stay in business.

Energy Doctrine Versus Energy Science

What will energy education look like when it has been incorporated into the mass-market basal textbook series that dominate U.S. social studies school programs? Energy, we might think initially, isn't a very controversial topic and shouldn't evoke too many disputes. But, with a little reflection we can identify some aspects of knowledge about energy that, among some groups, typically stir up heat and just as typically get swept under the rug in textbook production. The treatment of some concepts in biology textbooks (other than BSCS) provides an example of what we can expect when energy emerges in the social studies textbooks. In recent months, but certainly not for the first time or likely the last, the validity of the general theory of evolution and of the special theories, such as natural selection, that scientists employ to extend evolutionary knowledge provided by fossil records and modern molecular biology, has come under public scrutiny, especially in the legislatures of several states* where law makers are seriously considering proposals to give

* California, Colorado, Iowa, Minnesota, Oklahoma, Tennessee, and Texas, among others (Kyle, 1980).

"scientific creationism" equal time in the curriculum. (The stimulus for much of this legislative activity comes from groups, such as the Creation Research Society, that often have series of science texbtooks for sale.) The belief in a literal interpretation of the Biblical account (based on the early 17th century King James translation) of the creation of the universe and, more pointedly, of the members of the family Hominidae of the order of primates, Homo Sapiens, has spilled over again into disputes about the content of the science curriculum. (The sympathy of our incoming president for this antiscientific viewpoint does not portend well for the continuation of influence by scientists on the curriculum that began with the curriculum reforms of the 1960s.) In the biology texts prepared for adoption throughout the United States we find deliberate distortions of what is known about human evolution so that fundamentalists will not be offended by scientific evidence that is contrary to their religious beliefs about the origin of the human race. The biology texts use expressions such as, "some scientists believe that..." rather than more accurate statements such as, "it is generally accepted in the scientific community that..." in relation to many basic premises of biological and geological knowledge.

The formation of fossil fuels, such as coal and petroleum, as it is generally accepted in the scientific community, took place hundreds of millions of years ago and the process lasted in the neighborhood of fifty million years. But, to people who hold the religious doctrine that the earth was created only six to ten thousand years ago (and in six earth days), such knowledge is hard to deal with, especially if the textbook account states that oil was formed "a long time ago," or "a long, long time ago," or even "a l-o-n-g, l-o-n-g, l-o-n-g time ago." It will be rather hard to formulate a scientifically accurate notion of the irreplacability of fossil fuels if the formation time element is fudged-over in textbooks. If they do it in biology they'll do it in social studies.

But it's not only pressure exerted by advocates of antiscientism that will affect the look of energy studies in the currriculum; fundamentalists of economic theory also resist some forms of inquiry. The zealots of free-enterprise capitalism (many of whom have series of textbooks ready for adoption) are quick to attack any suggestion that energy could be regarded as anything other than the legitimate property of the energy industry. As we have seen in past battles in places such as Florida, the advocates of the free-enterprise doctrine can frequently bring about legislation defining the economic content and philosophic grounding for social studies programs. It's not hard to see how some observers of education regard academic freedom for precollege teachers as a myth.

The "free" energy education materials provided by electric utility and oil companies are very biased in their treatments of both technological and economic issues, particularly with regard to nuclear power plant construction and operations (National Science Teachers Association, 1980). In fairness to the textbook publishers, I think that the technical specialists and economists who advise textbook editors and authors will likely bring about a relatively better balanced treatment of these issues than the energy industry is currently doing.

Exposition or Experience?

While I have been critical of the forces that shape and the systems that provide us with energy education materials--all curriculum materials for that matter--I am also concerned about the nature of instruction that will go along with the materials on energy. I am generally optimistic, despite my lack of confidence in the intellectual courage of many textbook publishers, that the real curriculum--what goes on in classrooms--will incorporate energy studies in various forms. Energy is simply too hot a topic to ignore and energy

problems are going to be around for a long time. Some teachers will find ways to make doctrinaire materials scientifically accurate and captialize on opportunities to examine the biased materials of public utilities. But the instructional patterns prescribed by many of the energy studies units--and indigenous to the slavish use of textbooks*--place such a heavy emphasis on exposition rather than inquiry that I'm afraid that most students will end up as they always do, memorizing and reciting the scientists' answers to the scientists' questions. Energy is a very complicated concept; most social studies educators (me included) don't feel especially competent about expounding on the scientific and technical aspects of complicated scientific concepts. We tend to rely on expository methods of treating topics that are not within our realms of personal understanding, topics that we feel comfortable with because we have experienced them in concrete activities, scholarly research, or both. This is precisely why I advocate interdisciplinary approaches to energy studies. Social studies teachers can provide more effective instruction in the examination of the social dimensions of energy issues; science teachers can provide students with opportunities to develop personal understanding of scientific and technical phenomena of energy; the combination is, I believe, more likely to lead to increasingly complex understanding of energy concepts by students.

I summarized this sort of rationale in introducing a lesson reprinted in the journal of the California Council for the Social Studies from the BSCS Human Sciences Program. In an editorial note to an article by Mary McConnell (1980), I indicated that the lesson might,

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* But see Metcalf (1980) for some suggestions on getting out of the trap.

. . . at first glance, seem as though it belongs in a pyhsical science curriculum. The lesson, from the Human Sciences Program, seems to focus only upon technological concepts and activities - horsepower, work, energy - and may seem to be unrelated to social studies issues. The Human Sciences curriculum, as Dr. McConnell points out in the . . . article, is a unique effort to provide middle or junior high school students and teachers with interdisciplinary approaches to understanding some of the complex issues of life in modern, technologically-oriented societies.

The Human Sciences curriculum, generally, tries to provide students with opportunities for direct personal experience with the object of study in addition to abstract information about the topic. The . . . lesson enables students to "fit" the concept of horsepower into their own personal - physical - sets of life experience. Real understanding of either the social or technological aspects of horsepower is more likely to develop, according to the rationale underlying the curriculum, if students have experiential bases upon which to construct more elaborate ideas about the concept. Horsepower is a very common term in U.S. society, but is not well understood by most of us who use it as a "name" (rather than a power rating) for the engines in our automobiles.

Once students have developed a concrete level of understanding about horsepower they are more likely to be able to make sense - and be more interested in making sense - out of more complex questions such as the following:

- Should the government limit the horsepower of automobile engines to conserve energy resources?
- Do we waste energy in our households? Schools? Office? Factories? Transporation systems?
- What is a fair share of horsepower for personal consumption? How can society allocate diminishing energy resources for individuals? Industry? Recreation?

In short, I believe that we must try to balance exposition with experience in energy studies and, as well, in all other areas of the curriculum that involve complex issues of science and technology. If it's worth doing, it's worth doing well.

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